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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/005,000	12/07/2001	James H. Lee	H-204145	1829
7590	03/24/2004		EXAMINER	
CARY W. BROOKS			ALEJANDRO, RAYMOND	
General Motors Corporation			ART UNIT	PAPER NUMBER
Mail Code 482-C23-B21			1745	
P.O. Box 300				
Detroit, MI 48265-3000			DATE MAILED: 03/24/2004	

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	10/005,000	LEE ET AL.
	Examiner Raymond Alejandro	Art Unit 1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 03 March 2004.  
 2a) This action is **FINAL**.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1,2,4,5,7 and 8 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1,2,4,5,7 and 8 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 07 December 2001 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____.
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
	6) <input type="checkbox"/> Other: _____.

## **DETAILED ACTION**

### ***Response to Amendment***

This communication is responsive to the amendment filed on 03/03/04. Prosecution on the merits of this application is reopened on claims 1-2, 4-5 and 7-8 considered unpatentable for the reasons indicated below. Thus, the indicated allowability of claims 1-2 and 7-8 is herein withdrawn in view of the newly discovered reference(s) as seen below. Hence, for purpose of prosecution, the amendment of 03/03/04 (the amendment after-final) canceling claims 4-5 will not be entered. Rejections based on the newly cited reference(s) follow.

### ***Claim Objections***

1. Claim 2 is objected to because of the following informalities: the preamble of the foregoing claim recites “A proves”. It is noted that independent claim 1 recites “A process”. Thus, if applicants intend to recite “A process” please amend the claim to read so, otherwise further clarification is required. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 4 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Bloomfield 3982962.

This application is drawn to processes wherein the inventive concept comprises the specific steps of pumping, heating, expanding, compressing, and energy removal. Other limitations include the using shaft work to drive a pump.

As for claims 1, 4 and 7:

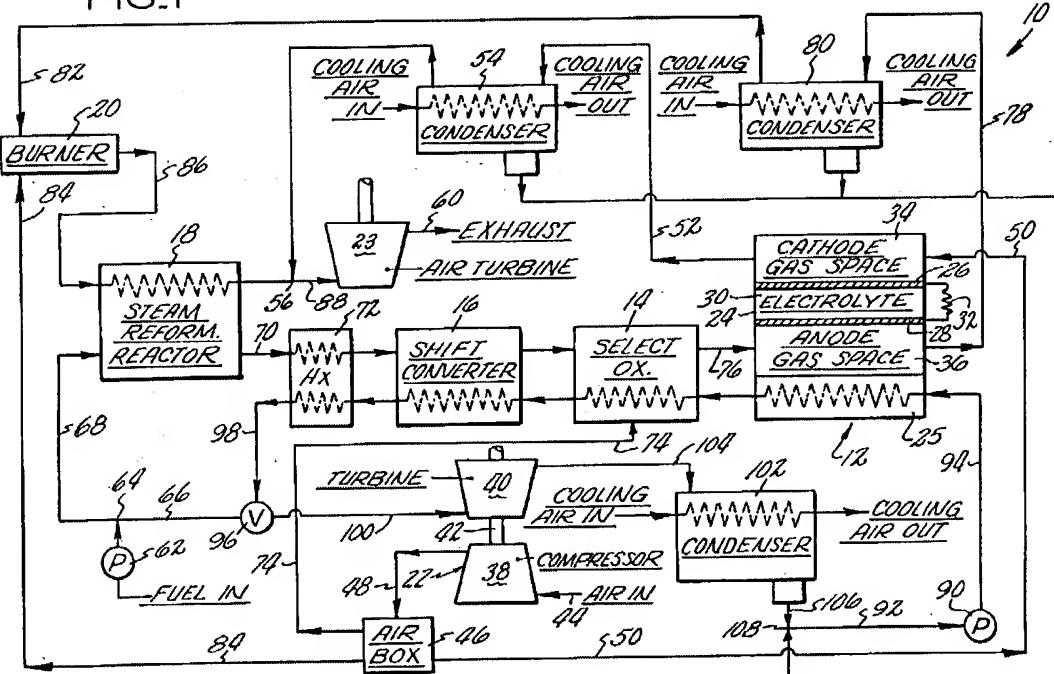
Bloomfield discloses a fuel cell power plant (TITLE) comprising as shown in Figure 1 below a pump 90 delivering water via a conduit 92 into thermal exchange relationship with stack 12 via a conduit 94 by passing the water through the thermal exchange portion 25 of the stack (COL 5, lines 28-32). It is disclosed the fuel cells comprises a single cell 24 and a thermal management portion 25 (COL 3, lines 23-27). Bloomfield discloses that the liquid is increased in pressure by pumps (COL 4, lines 1-5). Bloomfield further discloses that part of the water is changed to steam as it passes through the stack 12. The water and steam is superheated by passing it into heat exchange relationship with the fuel conditioning apparatus. It is further heated in the selective oxidizer 14 and the shift converter 16 and in the heat exchanger 72 (COL 5, lines 32-40). The steam then leaves the heat exchanger 72 and is delivered to a valve 96. Then, the remainder of the superheated stream is delivered into turbine 40 (the expander) via a conduit 100. The turbine drives the compressor 38 for compressing the air for the stack. The turbine is a steam driven turbine, however, any steam driven engine operably connected to run a compressor may be used (COL 5, lines 40-50).

Bloomfield further teaches that the exhaust from the turbine 40 is delivered into a condenser 102 via a conduit 104. Heat is removed from the steam by passing air through the condenser as shown. Liquid water, or possibly a mixture of liquid water and steams, leaves the condenser 102 via a conduit 106 and is combined at 108 with water recovered from the anode

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and cathode effluent gas streams in the condensers 54, 80. The water is then delivered to the pump 90 via the conduit 92 and the process starts again (COL 5, lines 50-62). It is disclosed that the amount of water lost in the Rankine cycle loop is recovered in the condensers 54, 80 and which is combined at 108 with the water which recirculates through the loop (COL 6, lines 1-6).

FIG. 1



Hence, Bloomfield teaches the specific pump, heat generating fuel cell system, expander, the compressor (the second fuel cell system component) and the condenser satisfying the specific spatial relationship and functional configuration as instantly claimed.

**Examiner's note:** with respect to the organic liquid, Bloomfield clearly specifies that water recovered from the anode effluent gas streams in the condensers 54 or 80 is combined at mixing point 108 with the cooling fluid of the fuel cell power plant (COL 5, lines 50-62). Bloomfield also teaches that the anode gas stream effluent contains enough unburned gas (emphasis added) such that there is no need for the burner 20 to have a separated fuel supply

(COL 4, lines 63-67). It is disclosed that on the anode side, a hydrogen containing liquid fluid such as naphtha is used as the reactant material. In addition, fuels such as methane may be used (COL 4, lines 1-15). *It is noted that naphtha and methane are organic fluids.* It is further disclosed that although the hydrogen containing liquid fuel such as naphtha is processed in the steam reforming reactor 18 (COL 4, lines 1-5), partial processed fuel leaves the reactor 18 (emphasis added), entering the shift converter 16 to only reduce the carbon monoxide of the gas stream (COL 4, lines 16-27), from the shift converter 16 the gases pass into the selective oxidizer 14 to even further reduce the carbon monoxide content of gases (COL 4, lines 28-36).

Bloomfield also teaches that a shift converter or selective oxidizer is not required (emphasis added), wherein the requirement of the fuel conditioning apparatus are dependent in part upon the type of unprocessed fuel being used (emphasis added) and upon the particular design of the cells (COL 4, lines 40-50). *Having shown that: a) only partially processed fuel such as naphtha leaves the steam reforming reactor 18; b) no further fuel conditioning such as the shift converter and the selective oxidizer is required; c) unburned gas remains in the anode gas stream effluent, and d) the liquid water or a mixture of liquid water and steam leaving the condenser 102 via a conduit 106 is combined at 108 (emphasis added) with stream recovered from the anode effluent gas streams, it is stated that some of the unprocessed and unburned naphtha reactant being fed into the reforming unit and the fuel cell will remain in the anode effluent gas stream and thus will be mixed at the mixing point 108 with the cooling water recirculating through the fuel cell cooling system. Accordingly, cooling fluid would includes both water and residual organic liquid naphtha as cooling liquid. That is to say, a mixture of cooling water and the unprocessed and unburned organic naphtha liquid will be circulating through the thermal exchange circuit of the*

*fuel cell system. Therefore, Bloomfield's teachings envision that a mixture of liquid water and unprocessed-unburned organic liquid naphtha might be used as part of the organic cooling fluid of the fuel cell system.*

Bloomfield discloses the fuel cell stack generally comprises a plurality of fuel cells 24 and a thermal management portion 25 (COL 3, lines 23-27/ COL 5, lines 27-31). *Thus, the heat generating component comprises the fuel cell stack itself.*

Bloomfield discloses other heat generating components such as the selective oxidizer 14 and the shift converter 16 as well as the heat exchanger 72 (COL 5, lines 28-40). The cooling fluid, for instance, picks up heat from the foregoing heat generating components (COL 5, lines 28-40). *In this case, the selective oxidizer and the shift converter represent catalytic combustors.*

It is disclosed that on the anode side, a hydrogen containing liquid fluid such as naphtha is used as the reactant material. In addition, fuels such as methane may be used (COL 4, lines 1-15). *It is noted that naphtha and methane are organic fluids.*

Thus, the claims are anticipated.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 2, 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bloomfield 3982962 as applied to claims 1, 4 and 7 above, and further in view of Ennis et al 5938975.

Bloomfield discloses a process for operating a fuel cell system according to the aforescribed aspects. Nonetheless, Bloomfield does not expressly disclose using the shaft work to drive a pump.

Ennis et al disclose a method and apparatus for energy fuel conversion systems (TITLE) including fuel cells (COL 4, lines 18-22/ COL 5, lines 40-45/ COL 23, lines 49-65). It is also disclosed that shaft work of the turbine can be for electrical generation only, or can also include work to operate one or more compressors or pumps (COL 6, lines 4-6).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to employ the shaft work to drive a pump of Ennis et al in the process of Bloomfield because Ennis et al teach that shaft work of the turbine can be used to operate pumps. Hence, this provides an efficient manner of utilizing and optimizing energy consumption in methods and apparatus of total energy fuel conversion.

***Response to Arguments***

1. Upon further consideration, a new ground(s) of rejection has been made as seen above. Accordingly, applicant's arguments with respect to claims 1-2 and 7-8 have been considered but are moot in view of the new ground(s) of rejection.
2. Prosecution on the merits of this application is reopened on claims 1-2, 4-5 and 7-8 considered unpatentable for the reasons indicated in the immediately preceding paragraphs. Consequently, the indicated allowability of claims 1-2 and 7-8 is herein withdrawn in view of the newly discovered reference(s). Hence, for purpose of prosecution, the amendment of 03/03/04 (the amendment after-final) canceling claims 4-5 has not be entered.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro  
Examiner  
Art Unit 1745

A handwritten signature in black ink, appearing to read "RAA", is positioned to the right of the typed name. A diagonal line extends from the end of the signature towards the right edge of the page.